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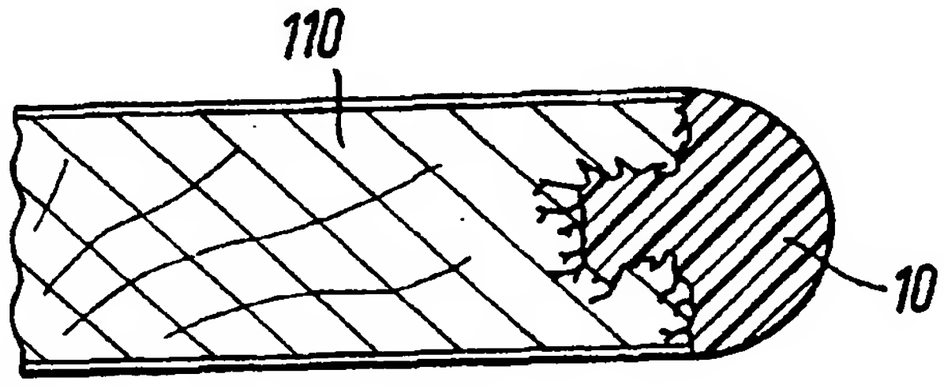
(54) Title: DOOR AND DOOR FRAMES




(57) Abstract

A door member (65) and/or door frame member (330) is edged (10) with a moulded plastics components (67, 68) the material of which, e.g. non-foamed polyurethane, infuses into the edge of the member. Plastics material of differing hardnesses may be used for different regions of the edges. The cross-section of the plastics component is curved, e.g. part elliptical.

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# Door and Door Frames

The present invention relates to means for closing an aperture in a wall, and in particular to a door and frame.

Known door and frame units are made from wood. The frame is usually made from timber lengths and the door is often made from cores of chipboard or other forms of timber with facings of chipboard, plywood or hardboard. The limitations of the materials of construction give rise to sharp edges and corners which are difficult to keep clean, are vulnerable to damage, and are hazardous to the user. Conventional construction requires additional operations to prepare the door and frame for locks and hinges.

The present invention seeks to provide a door and/or frame with rounded edges and/or radiused corners. Such a unit is suitable for use in hospitals and other buildings which require a high level of cleanliness and where doors are often subject to severe misuse and consequent damage.

It is known to produce furniture components such as desk tops from cellulosic panels that are either encapsulated with or edged by moulded polyurethane (PUR).

It is also known to produce doors with PVC and plastic laminate edges. However, the bond with the substrate is not perfect and so there is a tendency for the edging to come away in use. Also such edgings are not sufficiently durable to resist damage.

GB-A-1332551 discloses a method of moulding a foamable plastics material onto the exterior of a door member. The moulding space is filled by injection of a plastics material capable of foaming and afterwards hardening.

According to a first aspect of the present invention there is provided a door member or door frame member for an aperture in a wall, said member being of porous material and all or part of at least one external edge of said member containing the addition of a moulded-on plastics component characterised in that the material of said component is infused into the porous material.

The plastics materials preferably infuses into the porous material, e.g. wood, by 4 to 10 mm and thus effects a secure and jointless bond with the member Thus no special shaping of the edge of the member is required.

Preferably the material of the plastics component is non-foamed polyurethane. This has the advantage of being impervious to moisture. Moreover, suitable polyurethane compositions can be selected to give desired resistance to ultra-violet light, anti-bacterial properties and fire-resistant properties.

The polyurethane material may have a curved cross-section which reduces impact damage and is easier to clean. By providing a door and frame set in which the door member and the frame member have matching curved cross-sections, the draught-resistance and fire-resistance of a conventional door of rectangular cross-section can be achieved.

The curved cross-section may be substantially part-elliptical so that the plastic component combines the

above advantages with a flatter portion sufficiently large to allow seals or locks or other hardware to be fitted.

The plastics component may have selected regions of different hardness. Thus a harder material may be used where excessive wear is expected, and a softer material may be used where in-built sealing properties are required.

According to a second aspect of the present invention there is provided a method of making a door member or door frame member for an aperture in a wall, said member being of porous material, the method comprising positioning said member in a mould which surrounds at least part of one external edge of said member characterised in that the mould is then supplied with a flowable plastics material which is infused into the porous materials.

The moulding process may occur in a plurality of successive stages each involving the supply to the mould of a flowable plastics material of differing hardness. In a preferred arrangement the mould is tilted so that plastics edging regions of different hardness are provided at selected portions of said member.

According to a third aspect of the present invention,. there is provided a method of making a door member or door frame member for an aperture in a wall. comprising positioning said member in a mould which surrounds at least part of one external edge of said member characterised in that moulding occurs in a plurality of successive stages during which flowable plastics material of differing hardness is supplied to the mould

and bonds to selected portions of said member.

As mentioned above this enables special impact and sealing regions to be built into the plastics component. By selecting the number and timing of the stages, and by using a moulding process which involves a flowable plastics material introduced into a tiltable mould, the hardness distribution throughout the plastics component may be carefully controlled. The stages may be arranged to be quasi-continuous, or suitable delays may be provided between stages to allow the material to harden. Additional properties such as colour and density can be varied at the same time.

The invention also provides a door member or a frame member made by a method in accordance with the second or third aspects of the present invention.

Thus the invention basically provides a door and/or a door frame, at least an edge of which is covered in a plastics material to effect a jointless bond with the frame and/or door.

The plastics material may just be on the edges of the door or frame or it may encapsulate it. Only one side of the door may be covered.

Preferably, the door and/or frame is made from one or more cellulosic materials.

The invention also provides a mould for making doors and/or frames as described, wherein the length and/or width of the mould is adjustable to adjust the height and/or width of the frame and/or door. Where the door or frame has one or more glazed panels, the mould is preferably further adjustable to vary the size of the

glazed panels.

The invention may also be applied to windows and window frame members.

Preferred embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, of which:

Fig.1 is a cross section through a typical door panel edged with polyurethane (PUR);

Fig.2 is a cross section through a typical panel edged with an alternative arrangement of PUR mouldings;

Fig.3 shows a front view of a single door and frame unit with PUR edging;

Fig.4 shows a front view of a double door unit with an over-panel and PUR edging;

Figs.5a to 5d show four variants of the unit shown in Fig.3;

Fig.6 is a section on 6-6 in Fig.3;

Fig.7 is a detail of the corner of the unit in Fig.3;

Fig.8 is a section on 8-8 in Fig.4;

Fig.9 shows a glazed section of a door as shown in any earlier drawings;

Fig.10 shows a further glazing arrangement; and

Figs. 11a to 11d show catches fitted to any of the

doors shown in the earlier drawings.

Fig.1 shows a door panel 110 trimmed with PUR 10. The PUR infuses into or permeates the timber construction forming a very strong bond. The construction is jointless. The door panel can be edged with PUR as shown, or completely encapsulated in a PUR skin.

Fig.2 shows an alternative arrangement for moulding the PUR edging 25 where the door panel 220 is first edged with a timber lipping 22.

Fig.3 shows a door/frame unit according to the invention. The corners 30 of the door 65 and frame 330 are radiused. PUR can be applied to either the edges of the door and/or frame. Different configurations are discussed in relation to Fig.5.

Fig.4 shows an alternative unit having two door panels 41,42 and an over-panel 44.

Different door/frame unit configurations are shown in Fig.5. Fig.5a shows a combined timber 50 and PUR 51 frame and a door 55 having a wide PUR edge 52 on the vertical edges.

Fig.5b shows a door frame 57 that is completely faced in PUR and a door 58 with a narrow PUR edge 53 on all edges.

Fig.5c shows an all timber frame 59 with the door 58 shown in Fig.5b.

Fig.5d is a bulkhead type door unit which has a frame 550 on four sides. The frame 550 is PUR and timber, and the door 551 has a PUR edge 54 on all edges.

Fig.6 illustrates the construction of the unit shown in Fig.3. The frame 330 is in two parts 61,62 each being separately fixed with fixings concealed by a stop member 63. The frame is fixed to a wall 64 and supports a door 65. The edges of the door frame are either edged with PUR 66 (part 61), in order to retain some decorative wood appearance or to limit the protection provided by the PUR to vulnerable areas, or completely faced in PUR 67 (part 62). Both alternatives are shown in Fig.6. The PUR coated edges 68 of the frame are part-elliptical in cross-section. The part-elliptical edges provide a smooth edge for ease of cleaning and resistance to damage but provide a sufficiently wide flat edge for seals or locks to be fitted. The stop 63 is formed from a base material such as MDF, chipboard or hardwood coated in PUR on the visible surfaces. A recess 69 carries a seal (not shown).

Fig.7 shows a detail of the corner of the unit shown in Figs. 3 and 6. The frame is timber 61 with a PUR edging 68. The stop 63 extends around the corner. The corners of the door and frame are radiused.

Fig.8 is a section through the unit in Fig.4. This is similar to the unit shown in Fig.6 but has an over-panel 90 between the door and the frame. A stop extends down both sides of the door. The corners of the frame 91, the over-panel edged in PUR 92, and the door edged in PUR 93 are all part-elliptical in cross-section. A seal 94 extends along the top of the door.

Fig.9 shows how a glazed panel can be inserted into the doors shown. A glass sheet 100 is held between two beads 101. The beads are made from a base material coated with PUR on its outer surfaces. Fixings 102

(only one shown) can be used to secure the beads to the door 103.

Fig.10 shows a further arrangement of a glazed panel in a door 105. Two sheets of glass 106 are separated by a spacer 107 coated with a PUR layer 108. The glass is bonded to the PUR by a layer 109 of adhesive as mastic.

This arrangement has the advantage that the glass is flush with the outside of the door. This makes the door easy to clean. The arrangement also minimises the number of ledges on which dust can settle.

The glass may be bonded directly to the door using the PUR layer as the adhesive. To improve the bond between the glass and PUR the edge of the glass can be chamfered.

The spacer can be omitted and the glass held in recesses in the outside of the door panel. A layer of soft PUR can take up any tolerances in the unit. A single sheet of glass can be used if double glazing is not required.

Fig.11 shows how a lock is fitted to the door and frame units described. The door is moulded with a small recess 111 either side of the door centre line (Fig.11a). The recess is formed in the PUR during moulding. The lock case 112 and forend 113 extend through this recess. Fig.11b shows the keep 114 in the frame and Figs.11c and 11d show side and front elevation of the unit

The hinges holding the door panels to the frame are positioned in moulded recesses in the PUR and screwed directly onto the core panel of the door. A further PUR

layer can be moulded over the part of the hinge that is screwed to the door panel.

To produce a PUR edging on a frame section or door panel the prepared panel or section is inserted into a mould usually but not exclusively made from silicon rubber, glass reinforced plastic or epoxy resin, on a timber or aluminium frame. The mould is formed in two parts which are clamped together around the panel or section. The PUR material and a hardening agent (which determines the setting time) are supplied in two parts which are mixed in a nozzle prior to injection in the mould. The mould is then inclined so that the edge to be coated is at an angle. The PUR edging material is forced under low pressure into the lower corner of the mould. The mould is vented at the top corner.

In certain cases it is desired to mould a plastic component in which selected regions have a different hardness. By moulding in a plurality of different stages and by adjusting, if necessary, the inclination of the mould and/or the points of plastics supply to and air venting from the mould, the hardness distribution throughout the component may be carefully controlled.

If desired,the mould may itself be adjusted between stages; however this has the disadvantage of being time-consuming.

To produce a unit having an over-panel such as is shown in Fig.4 adjustable moulds can be used so that the over-panel height and the length of the frame sections can be varied.

The PUR penetrates cellulosic substrates, forming a very strong bond. For example, the PUR can penetrate up to 10mm into a chipboard panel. Panels and lintel sections of almost any thickness can be edged. A single edged section can be up to 7m in length. The process produces joint free edges which are impenetrable to moisture.

If a thick panel is used the PUR edging tends to shrink back. If high tolerances are required the thickness of the PUR coating should be kept constant. This can be done by using the arrangement shown in Fig.2.

The properties of the PUR used can be varied by the use of additives. The hardness of the PUR can be varied from Shore D70 to Shore A30. Generally isocyanate polyurethanes are preferred to polyol polyurethanes because of their stability to ultra violet light. Anti-bacterial agents can be added to the PUR. Other additives can be used to improve the performance in a fire.

The PUR moulding can be applied in any colour that is desired.

Door/frame units incorporating PUR edges have a number of advantages over known units. The units preferably have curved edges. This makes them safer to use and less vulnerable to damage when hit by, say, trolleys. This is particularly so if a soft PUR is used that will absorb impact.

The corners of the doors, frames, and glazed apertures are radiused. This means that they are easier to clean and trap less dirt than conventional right-angled corners. This also allows a continuous seal to be

formed around the door/frame gap. This is important where high levels of cleanliness are required such as hospital operating theatres, and in areas where high levels of sound, draught, or smoke resistance are needed.

The nature of the PUR material gives it a number of advantages for use in the type of unit described. The unit is durable because of the strength of bond between the substrate and the PUR moulding. The PUR moulding itself is durable and abrasion resistant. The moulding can be made in virtually any colour. The material has satisfactory combustion characteristics for use in hospitals and other high safety areas. The material is also capable of being recycled. PUR will resist most domestic cleaning agents and organic solvents.

A number of modifications can be made to the embodiments described. The basic design of the door/frame unit can be varied and PUR can be applied to selected edges of the frame or door. The doors and frames shown in Figs 5a to 5c can be used in any of the various combinations shown and many other which can be contained within the scope of the invention as claimed.

The moulding process may also be used on non-porous substrates such as steel aluminium and other metals and glass. A suitable bonding agent must be used or the substrate must be totally encapsulated.

The surface texture of the PUR moulding can be varied. As previously indicated, the PUR edges can be moulded in a dual hardness material. In particular, by moulding the region of the door edge adjacent to the stop in a very soft grade of PUR, this acts as a seal

or buffer and the door is self-sealing.

The seal 94 on the unit shown in Fig.8 is an optional feature. Various seals can be used with the doors shown to fulfil different requirements.

The PUR can be in a chosen hardness (or softness) to suit different performance requirement.

The curved edges can have any suitable rounded cross section. Alternatively the corners may be square.

The PUR edging can be applied to window frames and sashes instead of doors and frames.

A disc can be fitted to the overpanel 44 of the unit shown in Fig.4. The disc is positioned where the doors 41,42 meet and acts as a stop.

CLAIMS

1. A door member (41,42,55,58,105,110,220,551) or door frame member (50,57,61,62,550) for an aperture in a wall, said member being of porous material and all or part of at least one external edge of said member containing the addition of a moulded-on plastics component (10,25,51,52,53,54,66,67,91,92,93,108) characterised in that the material of said component is infused into the porous material.

2. A member according to claim 1, wherein the material of said plastics component is non-foamed polyurethane.

3. A member according to claim 1 or 2, having edges which are curved in cross-section.

4. A member according to claim 3, wherein said edges are generally part-elliptical in cross-section.

5. A member according to any preceding claim wherein said plastics component has selected regions of different hardness.

6. A method of making a door member (41,42,55,58,105,110,220,551) or door frame member (50,57,61,62,550) for an aperture in a wall, said member being of porous material, the method comprising positioning said member in a mould which surrounds at least part of one external edge of said member characterised in that the mould is then supplied with a flowable plastics material which is infused into the porous materials.

7. A method according to claim 6 wherein the plastics material, e.g. non-foamable polyurethane, is supplied to the mould under low pressure.

8. A method according to claim 6 or 7, wherein moulding occurs in a plurality of successive stages with plastics materials of different hardnesses.

9. A method according to clim 8 wherein the mould is tilted so that plastics edging regions of different hardness are provided at selected portions of said member.

10. A method of making a door member (41,42,55,58,105, 110,220,551) or door frame member (50,57,61,62,550) for an aperture in a wall, comprising positioning said member in a mould which surrounds at least part of one external edge of said member characterised in that moulding occurs in a plurality of successive stages during which flowable plastics material of differing hardnesses is supplied to the mould and bonds to selected portions of said member.

11. A door member (41,42,55,58,105,110,220,551) or door frame member (50,57,61,62,550) for an aperture in a wall, said member being of non-porous material and all or part of at least one external edge of said member containing the addition of a moulded-on plastics component (10,25,51,52,53,54,66,67,91,92,93,108) characterised in that the material of said component is bonded onto said external edge or said member is totally encapsulated.

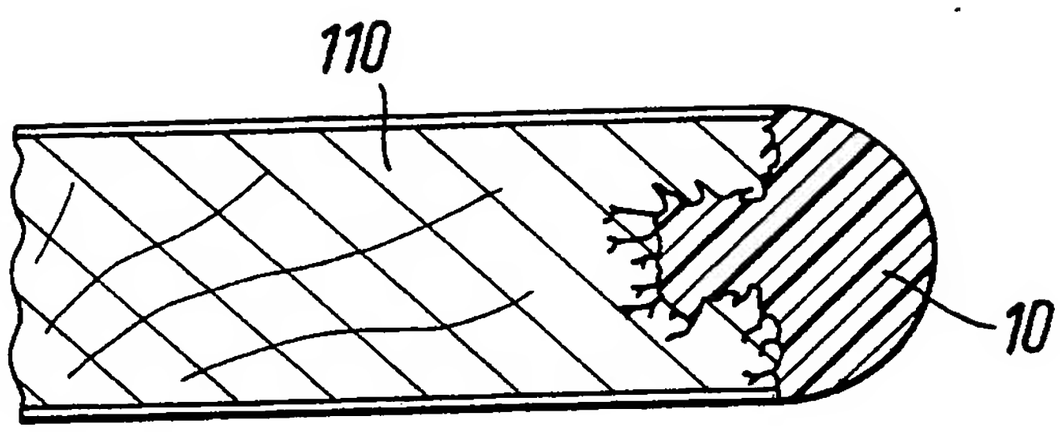


Fig. 1

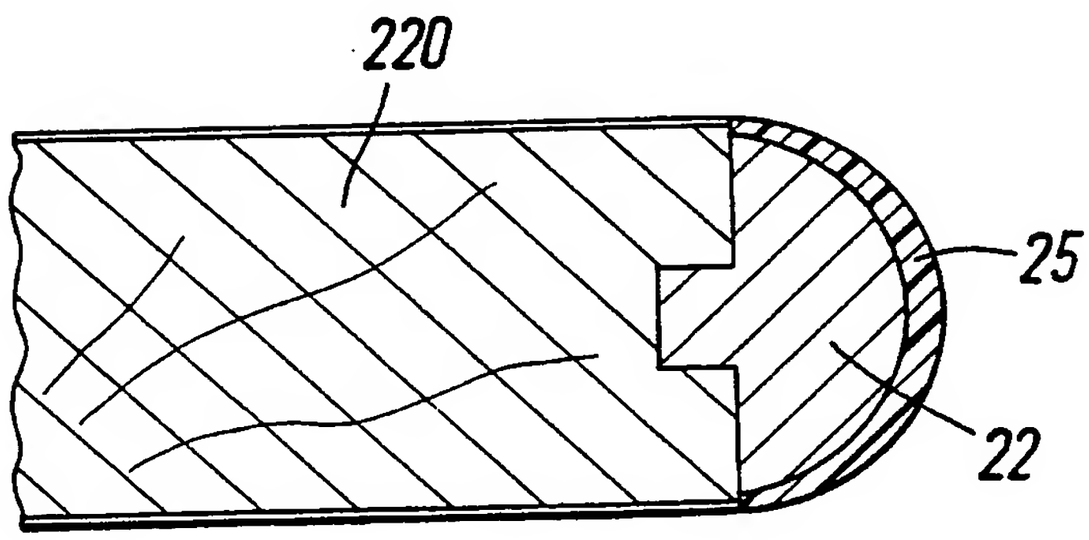


Fig. 2

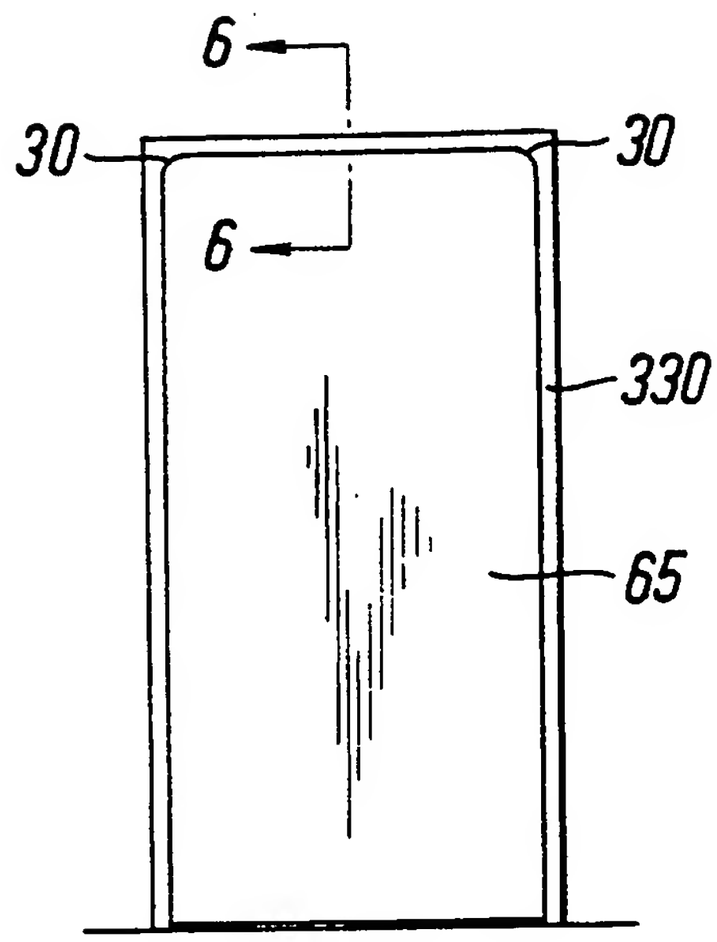


Fig. 3

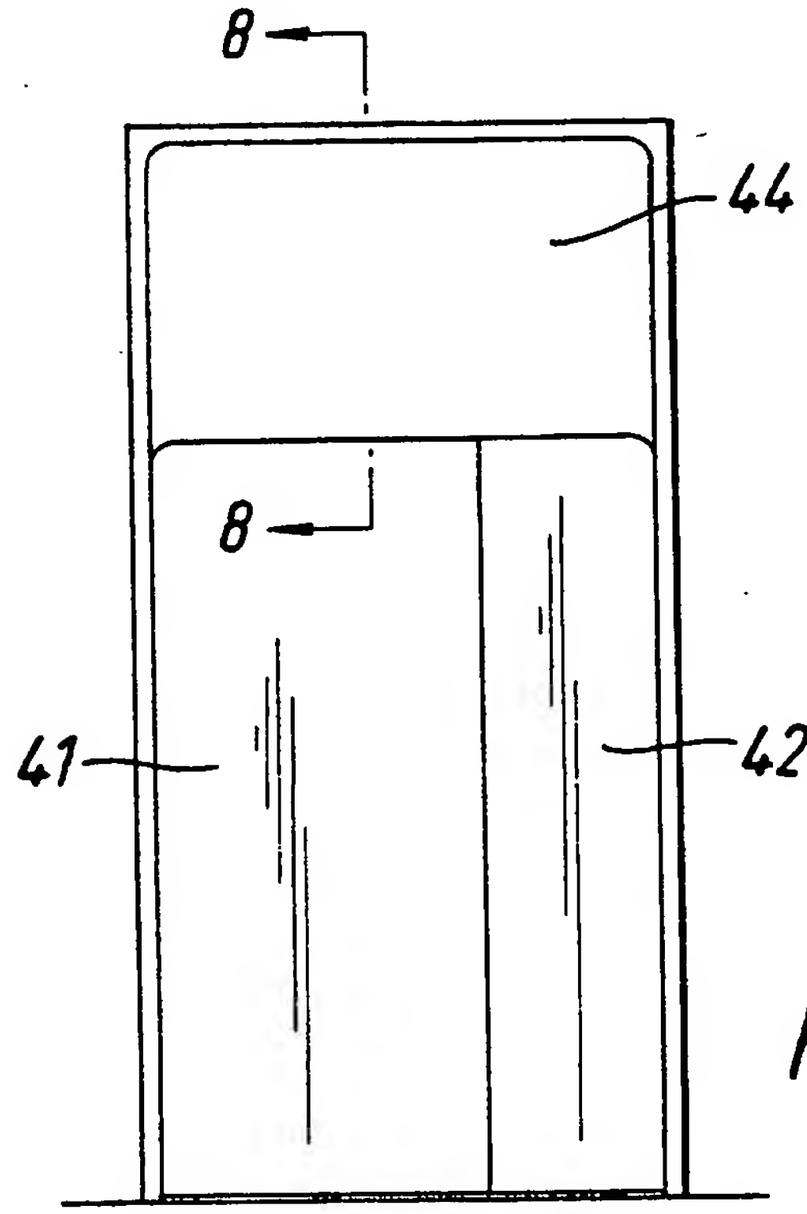


Fig. 4

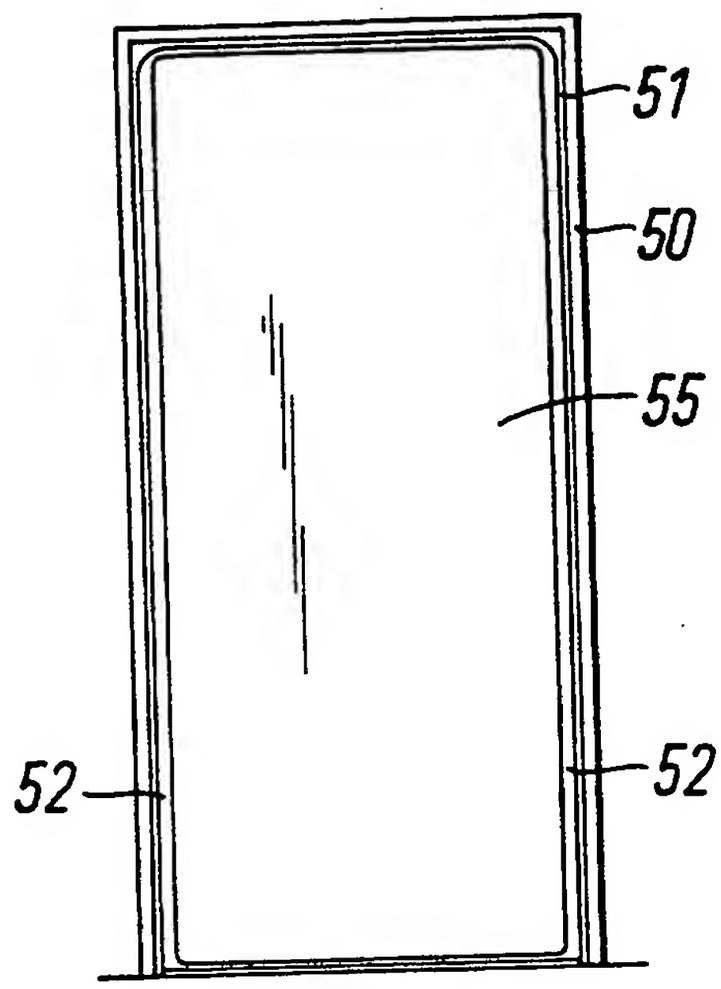


Fig. 5a

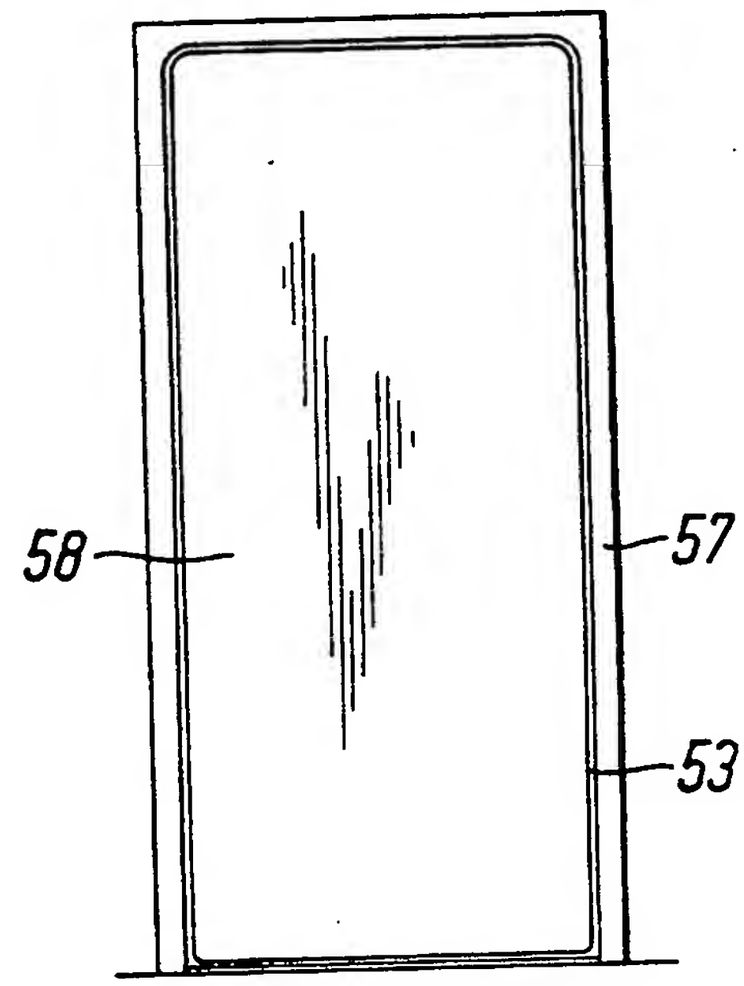


Fig. 5b

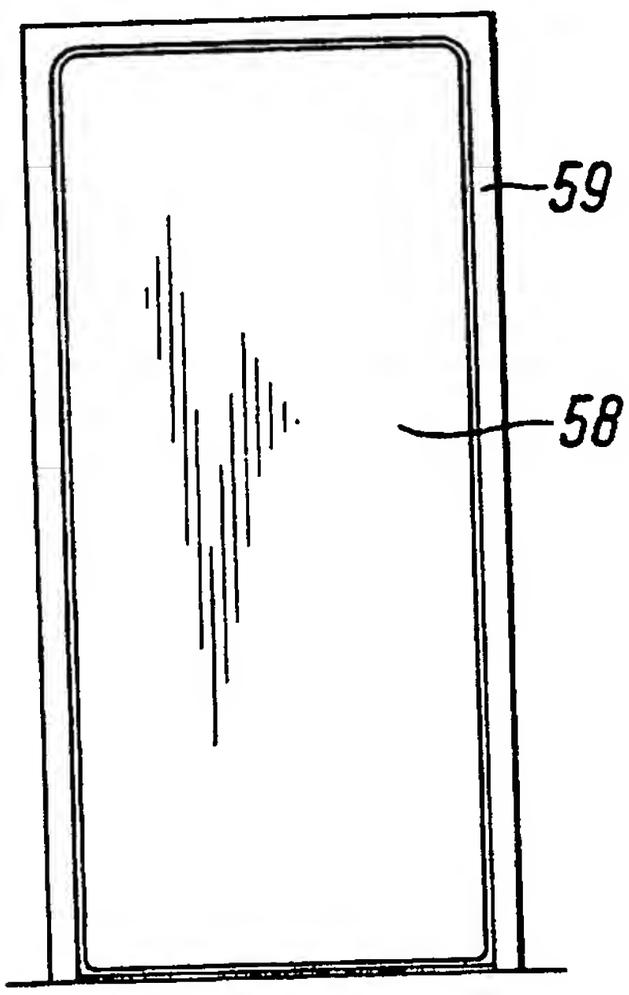


Fig. 5c

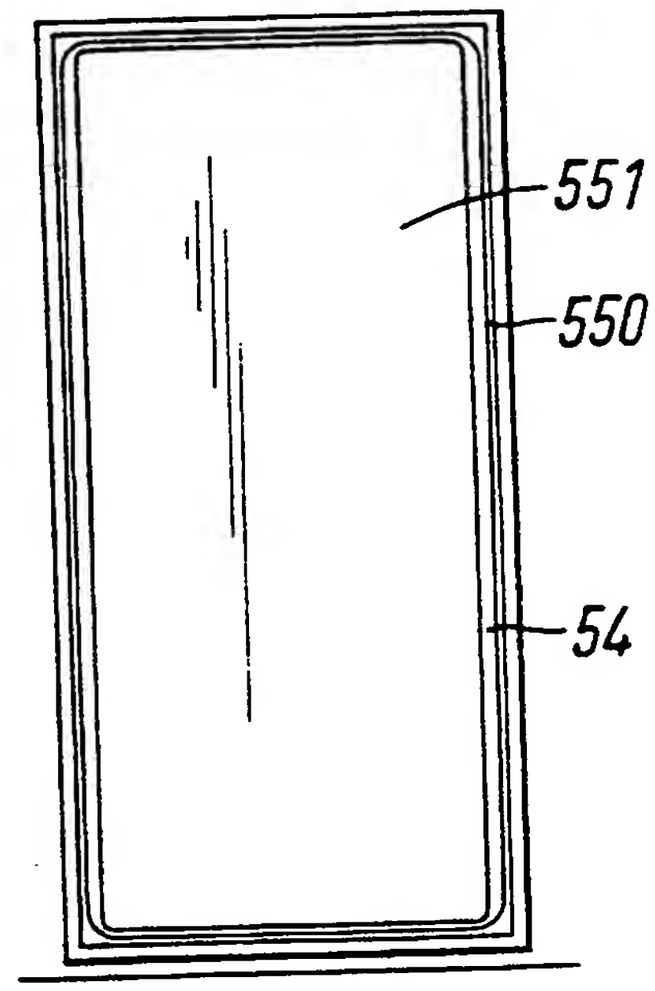


Fig. 5d

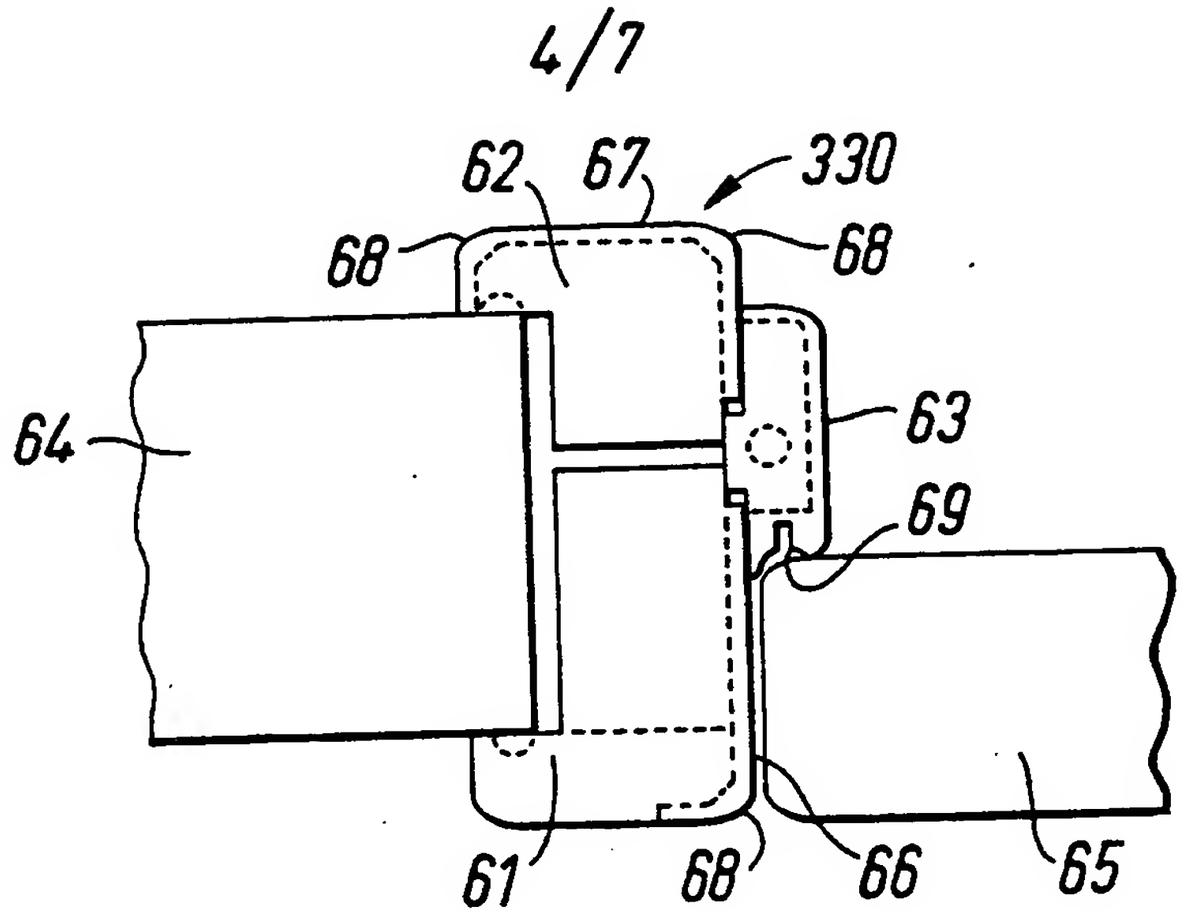


Fig. 6

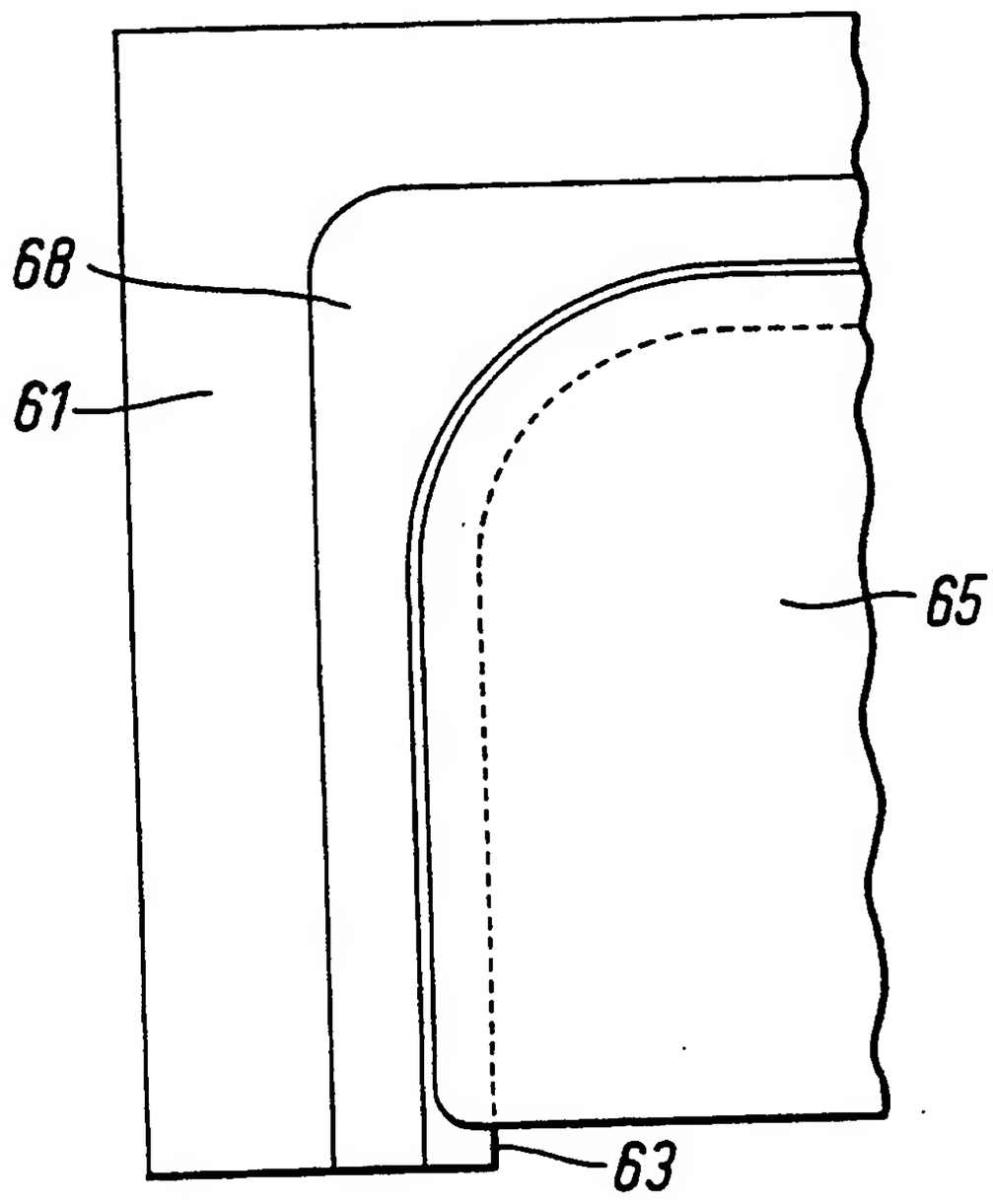


Fig. 7

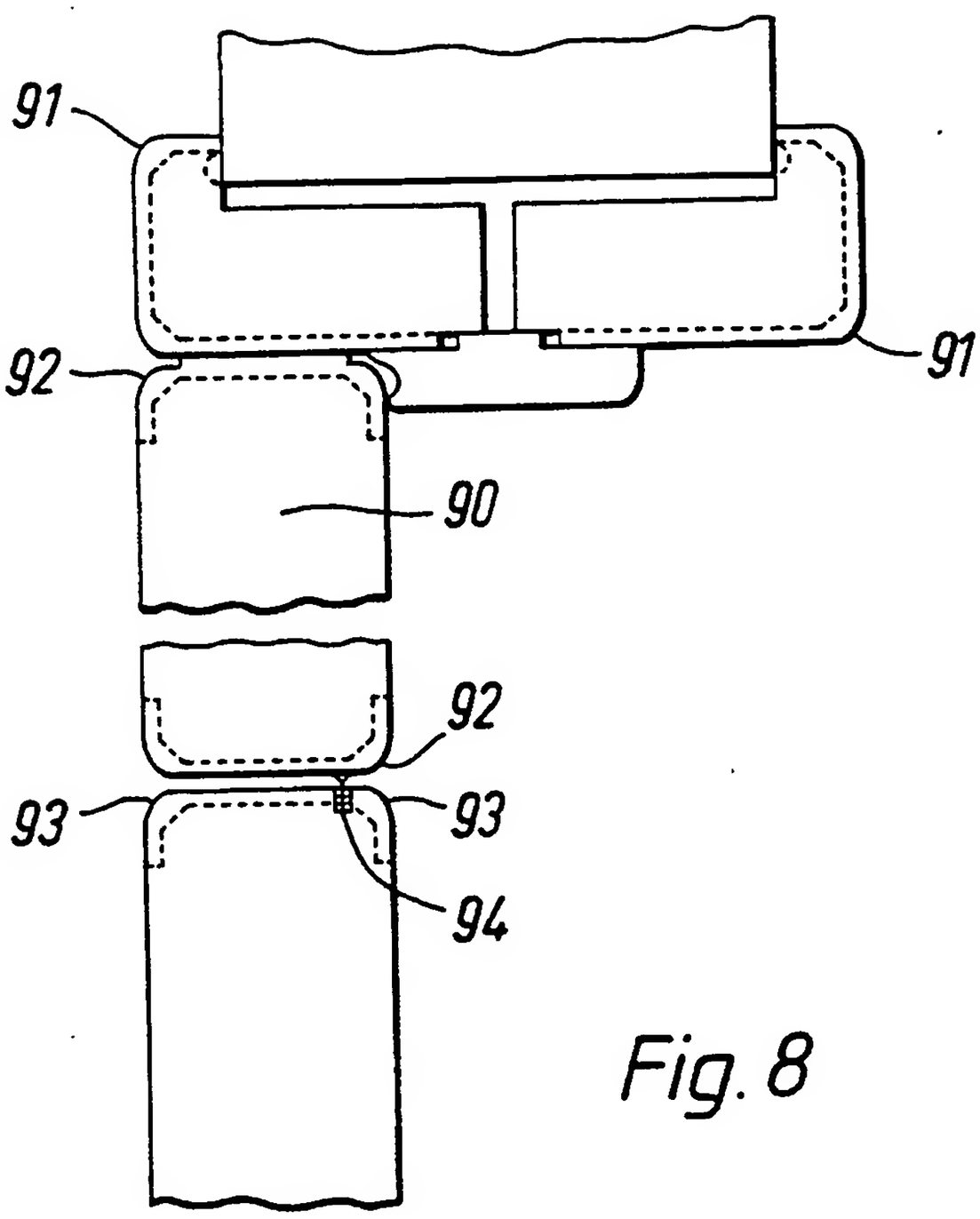


Fig. 8

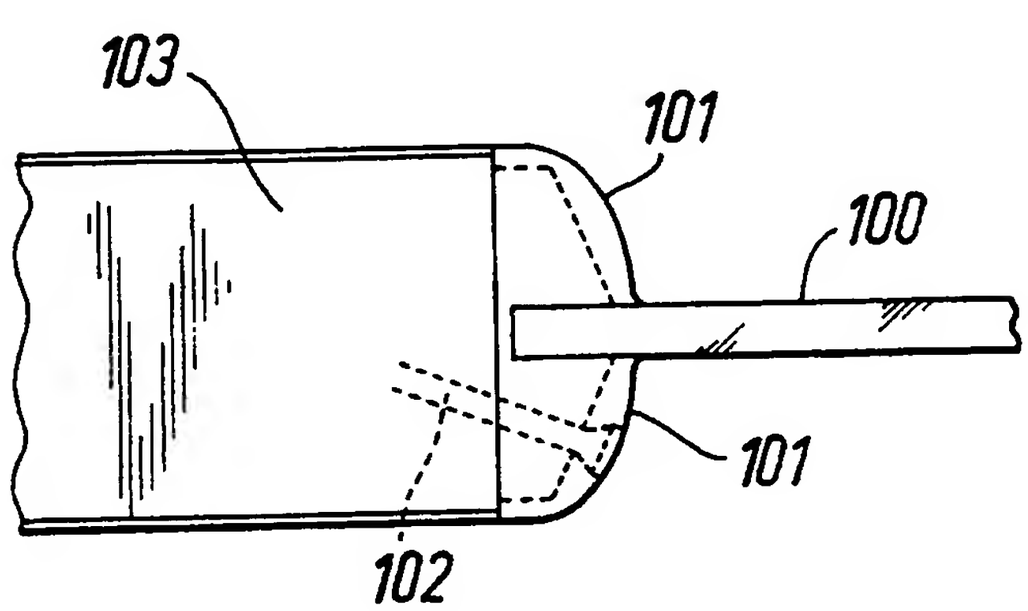


Fig. 9

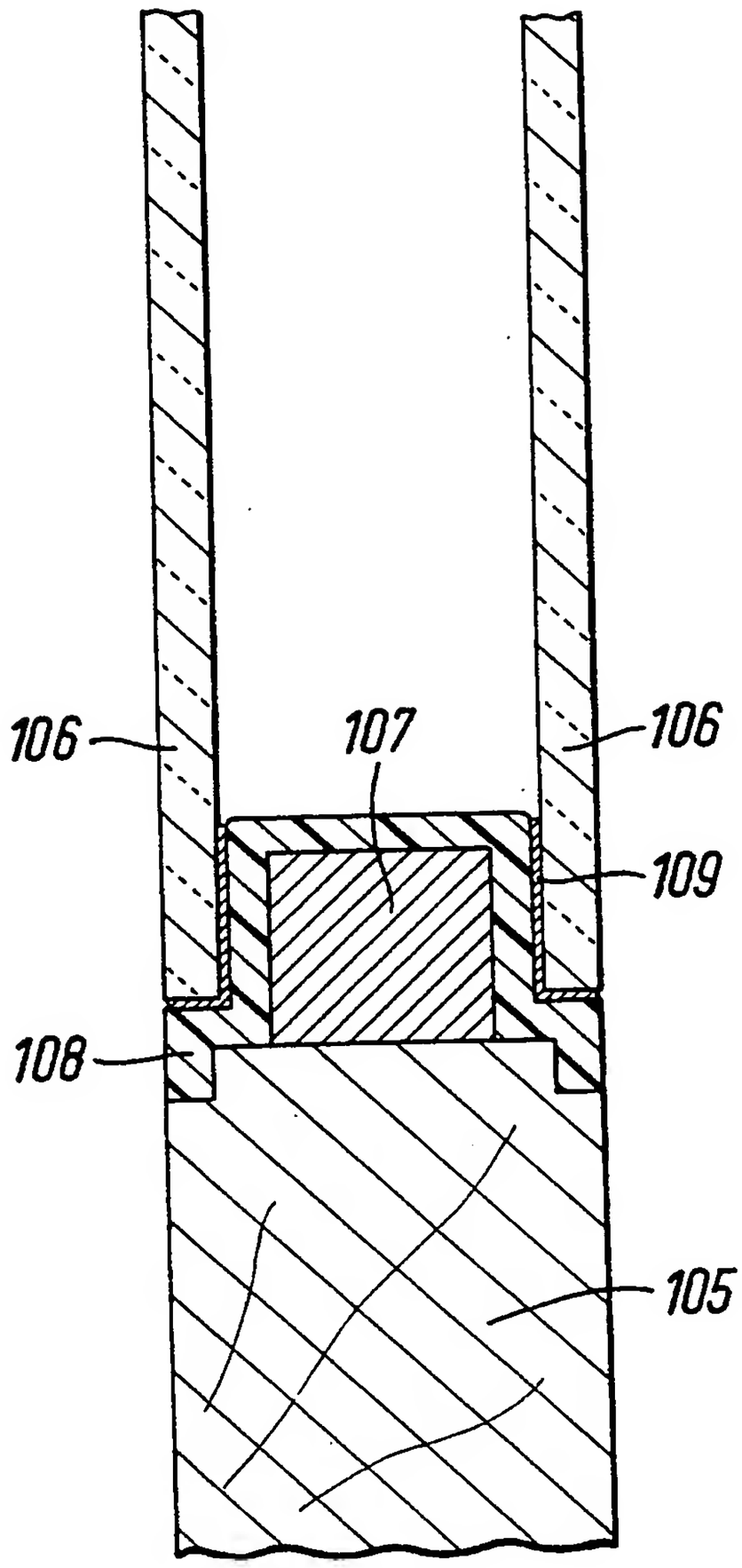


Fig.10

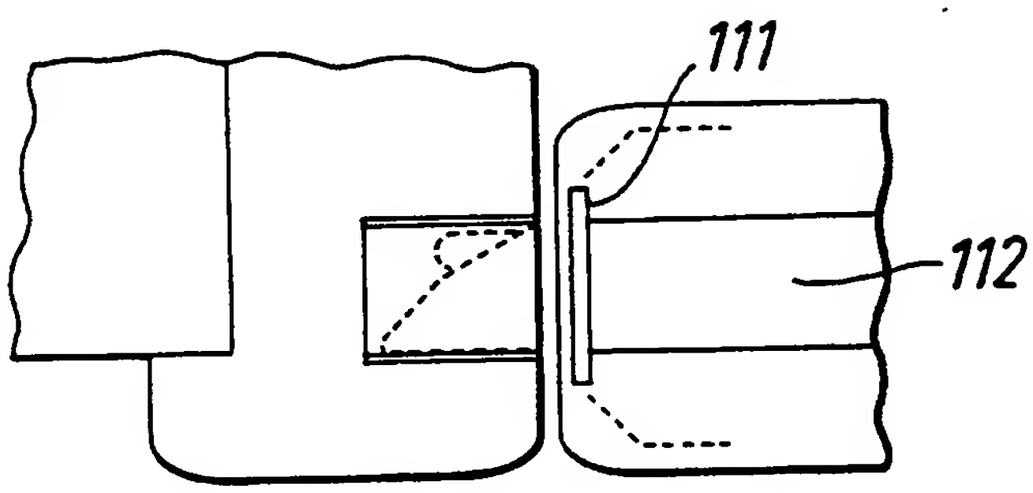


Fig.11a

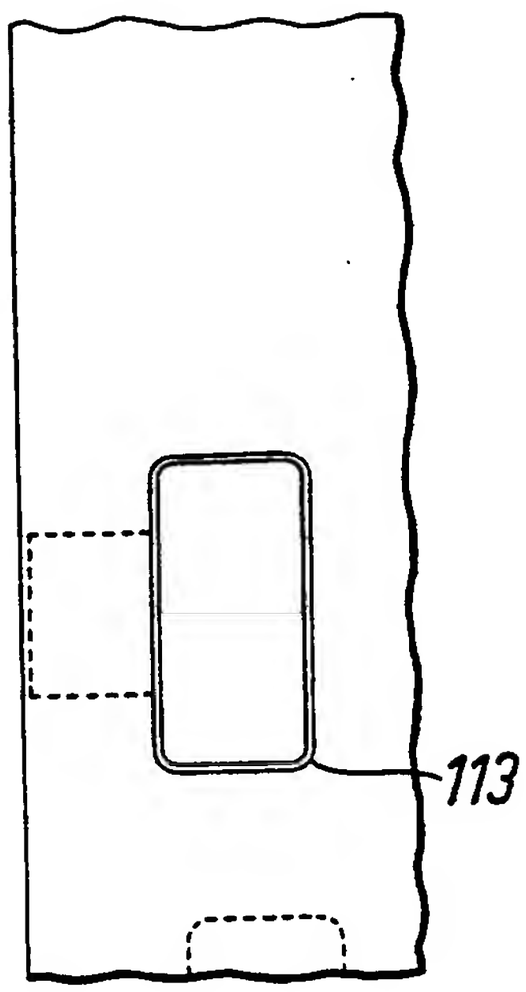


Fig.11b

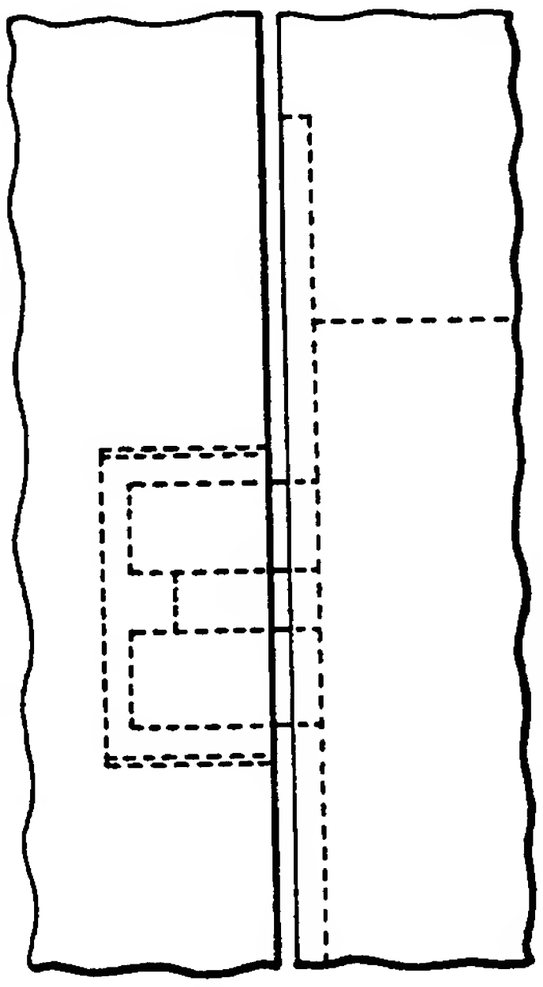

Fig.11c

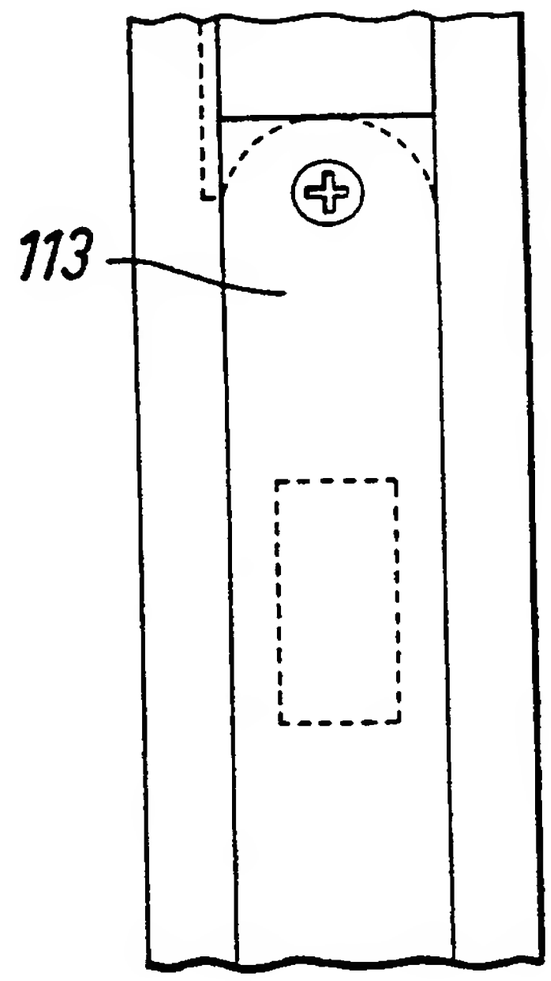


Fig.11d

# INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 94/00963

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 B29C67/18 E06B3/88 E06B1/34

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 E06B E04C B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|---|---|---|
| X | DE,A,32 05 232 (SCHOCK BAD) 25 August 1983<br>see the whole document<br>--- | 1-4,6,7,<br>11 |
| X | DE,A,27 30 617 (BEMICO-FREIZEITMÖBEL) 11 January 1979<br>see page 8, paragraph 4 - page 11, paragraph 2; figures<br>--- | 1-4,6,7,<br>11 |
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[X] Patent family members are listed in annex.

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| 7 September 1994 | 27. 09. 94 |

| Name and mailing address of the ISA | Authorized officer |
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| European Patent Office, P.B. 5818 Patentlaan 2<br>NL - 2280 HV Rijswijk<br>Tel. (+ 31-70) 340-2040, Tx. 31 651 epo nl,<br>Fax (+ 31-70) 340-3016 | Depoorter, F |

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